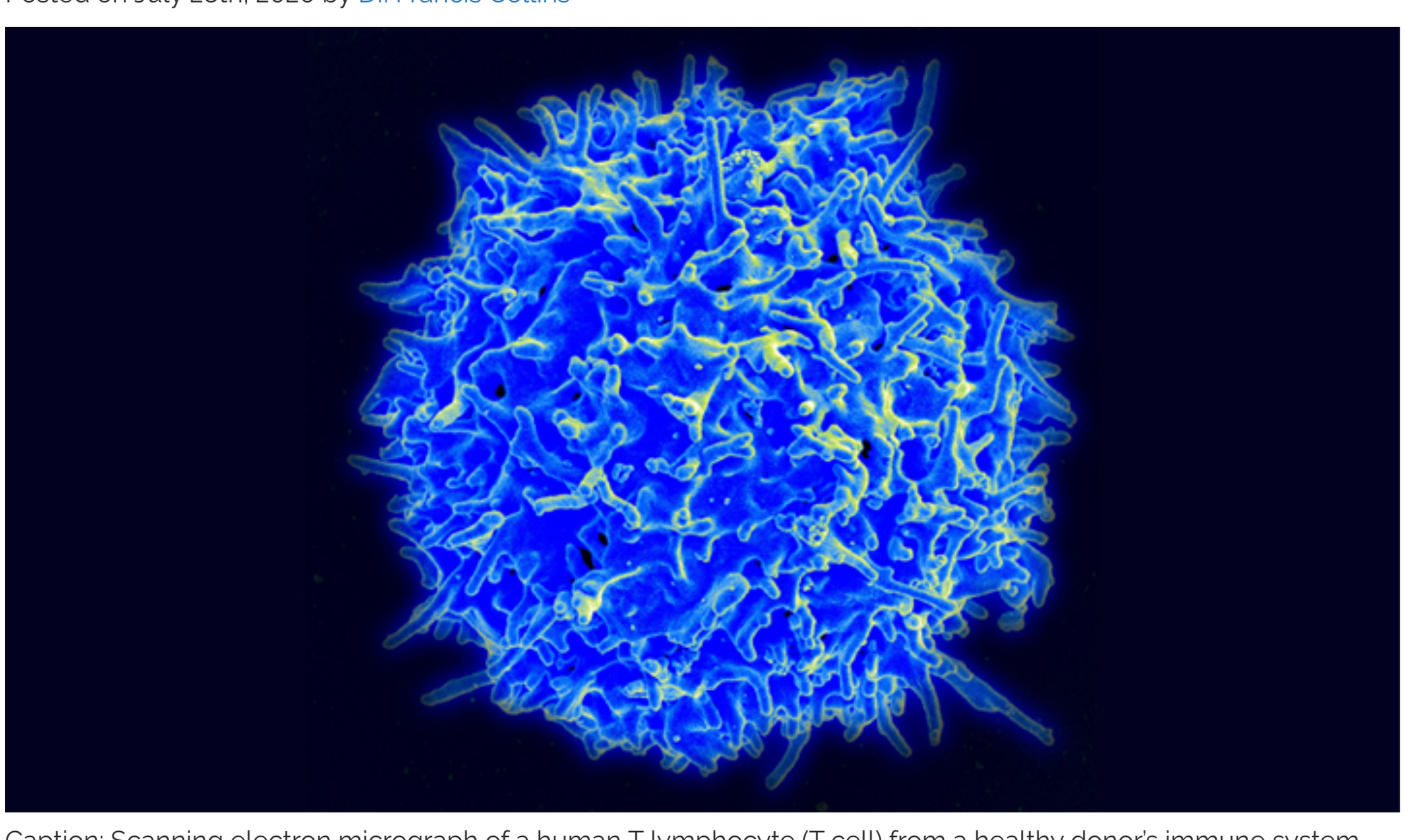
Immune T Cells May Offer Lasting Protection Against COVID-19

Posted on July 28th, 2020 by Dr. Francis Collins



Caption: Scanning electron micrograph of a human T lymphocyte (T cell) from a healthy donor's immune system. Credit: National Institute of Allergy and Infectious Diseases/NIH

Much of the study on the immune response to SARS-CoV-2, the novel coronavirus that causes COVID-19, has focused on the production of antibodies. But, in fact, immune cells known as memory T cells also play an important role in the ability of our immune systems to protect us against many viral infections, including—it now appears—COVID-19.

An intriguing new study of these memory T cells suggests they might protect some people newly infected with SARS-CoV-2 by remembering past encounters with other human coronaviruses. This might potentially explain why some people seem to fend off the virus and may be less susceptible to becoming severely ill with COVID-19.

The findings, reported in the journal *Nature*, come from the lab of Antonio Bertoletti at the Duke-NUS Medical School in Singapore [1]. Bertoletti is an expert in viral infections, particularly hepatitis B. But, like so many researchers around the world, his team has shifted their focus recently to help fight the COVID-19 pandemic.

Bertoletti's team recognized that many factors could help to explain how a single virus can cause respiratory, circulatory, and other symptoms that vary widely in their nature and severity—as we've witnessed in this pandemic. One of those potential factors is prior immunity to other, closely related viruses.

SARS-CoV-2 belongs to a large family of coronaviruses, six of which were previously known to infect humans. Four of them are responsible for the common cold. The other two are more dangerous: SARS-CoV-1, the virus responsible for the outbreak of Severe Acute Respiratory Syndrome (SARS), which ended in 2004; and MERS-CoV, the virus that causes Middle East Respiratory Syndrome (MERS), first identified in Saudi Arabia in 2012.

All six previously known coronaviruses spark production of both antibodies and memory T cells. In addition, studies of immunity to SARS-CoV-1 have shown that T cells stick around for many years longer than acquired antibodies. So, Bertoletti's team set out to gain a better understanding of T cell immunity against the novel coronavirus.

The researchers gathered blood samples from 36 people who'd recently recovered from mild to severe COVID-19. They focused their attention on T cells (including CD4 helper and CD8 cytotoxic, both of which can function as memory T cells). They identified T cells that respond to the SARS-CoV-2 nucleocapsid, which is a structural protein inside the virus. They also detected T cell responses to two non-structural proteins that SARS-CoV-2 needs to make additional copies of its genome and spread. The team found that all those recently recovered from COVID-19 produced T cells that recognize multiple parts of SARS-CoV-2.

Next, they looked at blood samples from 23 people who'd survived SARS. Their studies showed that those individuals still had lasting memory T cells today, 17 years after the outbreak. Those memory T cells, acquired in response to SARS-CoV-1, also recognized parts of SARS-CoV-2.

Finally, Bertoletti's team looked for such T cells in blood samples from 37 healthy individuals with no history of either COVID-19 or SARS. To their surprise, more than half had T cells that recognize one or more of the SARS-CoV-2 proteins under study here. It's still not clear if this acquired immunity stems from previous infection with coronaviruses that cause the common cold or perhaps from exposure to other as-yet unknown coronaviruses.

What's clear from this study is our past experiences with coronavirus infections may have something important to tell us about COVID-19. Bertoletti's team and others are pursuing this intriguing lead to see where it will lead—not only in explaining our varied responses to the virus, but also in designing new treatments and optimized vaccines.

Reference:

[1] SARS-CoV-2-specific T cell immunity in cases of COVID-19 and SARS, and uninfected controls. Le Bert N, Tan AT, Kunasegaran K, et al. Nature. 2020 July 15. [published online ahead of print]

Links:

Coronavirus (COVID-19) (NIH)

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47 Comments

***bggu* says:**
August 28, 2020 at 5:11 am
This is a matter of primary concern right now. Here is encouraging data. The public is eagerly awaiting covid 19 vaccine. Many thanks for the article from you.

Reply

***Kate W.* says:**
August 31, 2020 at 12:03 pm
If a person had Covid 19 and recovered due to her memory T cells, would she also produce detectable antibodies?

Reply

***Poppy* says:**
August 31, 2020 at 3:38 pm
Great question, I dint have the answer but I'm really interested.

Reply

***John Hasty* says:**
October 2, 2020 at 5:08 pm
Yes.

Reply

***Anil K Chauhan* says:**
September 3, 2020 at 3:02 pm
The viral RNA by binding to immunoglobulins will form immune complexes (ICs). These ICs by engaging CD16a and CD32a will differentiate the naive CD4+ T cells to become effector T cells that secrete proinflammatory cytokines. During contraction phase, this will lead to the development of long lasting memory cells. Originally, it was reported that Th2 responses were involved in COVID-19 pathology, but recent reports have implicated Th1 and Th17. We have shown in several papers in JBC, the role of ICs in the development of Th1, Tj17 and Tfh cells. However, upon vaccination, the populations reported in NEZM are very low and does not look convincing due to lack of availability of gating data. Immunology community has been nicely fooled by a single group that claims that CD4 T cells do not express FcRs. Several groups in HIV-1 patients have now shown the expression of CD32a and explored this receptor as possible marker for viral latency.

Reply

***Morgan M Falk* says:**
November 12, 2020 at 2:49 pm
So if you have autoimmune disease, you MAY be less susceptible.

Reply

***bestf* says:**
September 11, 2020 at 7:04 am
I hope this informative article will help me prepare for covid-19.

Reply

***nguyên h.* says:**
September 14, 2020 at 11:44 pm
Thanks for this very helpful topic. I love it and will learn more about it. Thank you very much.

Reply

***Neamhach* says:**
September 27, 2020 at 12:25 am
Do I understand from this article that perhaps 50% of population (more tests/stats needed for better "confidence level"?) MAY already have immunity of be immune to the Covid-19?

Reply

***John Hasty BS, MT(ASCP) Retired* says:**
September 27, 2020 at 9:31 pm
That's why natural active viral infections are important in immunity. Would you believe IT if I told you that the live oral Poliomyelitis vaccine that I received as a child has given me T memory cells that still help protect me from Polio today. Would you believe IT if I told you that it has been proven that an active viral infection will help protect you from other entirely different viruses. You go first and tell me all of the ACTIVE natural viral infection you have had in your life. Now, I will tell you all the ACTIVE natural viral infection that I have had in my life of 75 years: Polio (live vaccine), influenza, Chicken Pox, Small Pox (live vaccine 2 or 3 times), measles, mumps and probably rubella we called them childhood diseases. There were probably a couple more I received before service in Vietnam. 75 strong healthy and active and confident in my immune system.

Reply

***John Hasty* says:**
October 2, 2020 at 2:23 pm
In addition to being an active 75 year old I also participate in the Million Veteran Research Program where a pre Covid-19 blood specimen is on file. This program is conducted by the Veterans Administration. Also, I am enrolled in the All of Us Research Program where a pre Covid-19 DNA saliva specimen is on file. This program is one of the largest sponsored by the NIH.

Reply

***John Hasty* says:**
October 5, 2020 at 5:40 pm
In the midst of this current pandemic I would like to participate (volunteer) in any clinical trials that uses the live-attenuated COVID-19 virus created by deoptimizing the codon pairs of the virus.

I am afraid I will be overlooked for one reason or another. I believe this specific technology may also be receiving some support from NIH. Thanks

Reply

***iplaytx* says:**
September 29, 2020 at 7:30 am
Thank you John Hasty's very good comment. No lessons have passed through practical experience lessons

Reply

***Daria* says:**
October 2, 2020 at 6:35 am
Your information is useful and necessary, Please continue this wonderful work. Thanks so much for sharing,

Reply

***John Hasty BS, MT(ASCP) Retired* says:**
October 2, 2020 at 8:21 pm
In the midst of this current pandemic I would like to participate (volunteer) in any clinical trials that uses the live-attenuated COVID-19 virus created by deoptimizing the codon bias of the virus.

I am afraid I will be overlooked for one reason or another. I believe this specific technology may also be receiving some support from NIH. Thanks

Reply

***Lawrence A* says:**
October 5, 2020 at 4:03 pm
If we add t-cell immunity (greater than 50%) to antibody immunity (around 20%) we have over 60% immunity in the general population which qualifies as population immunity (herd immunity). This is why we have not seen exponential growth of the disease anywhere in the world and why we will not see a second wave…

Reply

***h. nguyen* says:**
December 4, 2020 at 5:13 am
Thanks for the information.

Reply

***Donna C.* says:**
February 15, 2021 at 12:53 pm
I've been waiting impatiently for someone to report this important information. Thank you for this article. I look forward to seeing more about this subject and more research on this very important topic. I would volunteer for any research trials or treatment. Godspeed to all, stay healthy, safe and continue to bring these important things to light for all …

Reply

***Lucille* says:**
March 24, 2021 at 1:55 pm
Thank you for the article. Where can I get tested for COvid 19 T cells?
My doctor has no knowledge that the test was approved by the FDA during March 2021.
What percentage T Cells would one need to not need the vaccine for Covid 19?

Reply

***Nikos altinakis* says:**
March 30, 2021 at 4:51 pm
Hello and thanks for this article.
If someone knows anything more i would like to add my case here.
A) i had some "strange" very mild cold/flu symptoms end of summer. No fever, no loss of smell or taste, bit headache 2 days before nose started to run, just nose running and a bit tiredom and muscular ache. Wife had for one day fever and she had also headache, more intense, also 2 days before nose running. Kid fever for 2-3 days, running nose, caughing. He was most serious than all. I was very very mild.
B) after 5 months (jan 2021) i was curious and made a covid19 igm and igg antibody test. Those days kid again had running nose and coughing but no fever. Wife no symptoms at all, just like me. Igm antibody positive with 1.13 (positive limit 1), igg antibody negative with 0.09 (positive limit 1.4)
C) everywhere i read that according to that result i should be in the acute phase of the infection. But i had absolutely no symptoms in january 2021.
D) i waited 10 days and redid the same test. This time igm was 1.22(even higher…) while igg was same 0.09.
E) i waited another 28 days and remade the same test hoping that this time i would ses some igg and, according to what i have read around, i should see negative igm. Well, igm negative it was but with 0.96 (so still close to the limit) and surprise igg was even lower 0.06. I want to add that all tests were made to same acredited laboratory.
F) bit background: i have passed at least 10-15 (maybe even more) times the flu in my life. Of course also cold. One time most probably i had passed aldo the bird flu (i dont remember the correct name). I have had a tuberculosis vaccine in army, 20 years ago. I have blood type 0+. I smoke – yes i have read about the nicotine effect on covid19.
G) the question (because it bothers me that i cannot find a lot of info about why someone can be asymptomatic) is: is it posdible that indeed i have passed completely asymptomatically covid19 and this to be because of these t cells that somehow in my case just killed the virus very fast?
H) second question: if i am a case that somehow i have these t cells that can kill fast the covid19, if i make the vaccine, wont these t cells go and kill what is in the vaccine = i will have no symptoms also after vaccination.
I) third question: if a person is asymptomatic because he has these t cells that kill fast the virus, will he continue to be asymptomatic for the near future? (i dont mention immune or immunity because it is a misleading term. Noone is immune, all can get infected, with vaccine or t cells or antibodies, just they can pass it essier or no symptoms at all)

Long post i know but the matter bothers me because tests and signs say that i should have/must have passed covid19 but i was completely absolutely asymptomatic (referring to jan 2021 when i gave the blood for the first sntibodies test)

Thank you.

Reply

***Nikos Altinakis* says:**
May 22, 2021 at 7:32 pm
Update:

Before i made my vaccine i did a 4th antibodies test and that showed minimum igm and igg was raised to 40% of positive limit.
Last blood test was done aproximately 90 days after first one.

Reply

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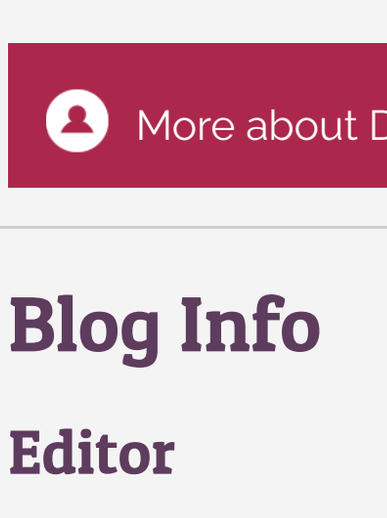

Francis S. Collins, M.D., Ph.D.

Appointed the 16th Director of NIH by President Barack Obama and confirmed by the Senate. He was sworn in on August 17, 2009. On June 6, 2017. President Donald Trump announced his selection of Dr. Collins to continue to serve as the NIH Director.

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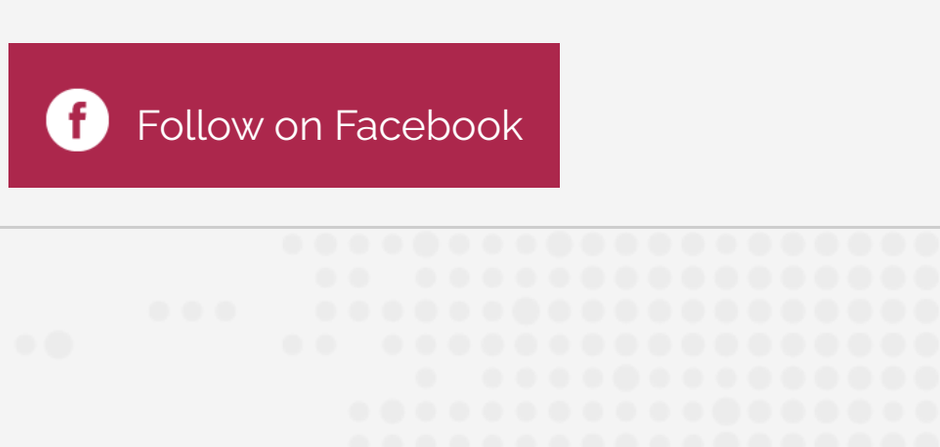

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